SEQUENCE LISTING

<110> King, Te Piao

Spangfort, Michael Dho

<120> RECOMBINANT HYBRID ALLERGEN CONSTRUCTS WITH REDUCED ALLERGENICITY THAT RETAIN IMMUNOGENICITY OF THE NATURAL ALLERGEN

<130> 02313/100H587-US1

<140> 10/091,135

<141> 2002-03-04

<150> US 60/272,818

<151> 2001-03-02

<160> 99

<170> PatentIn version 3.1

<210> 1

<211> 8

<212> PRT

<213> Vespula vulgaris

<400> 1

Asn Asn Tyr Cys Lys Ile Lys Cys
1 5

<210> 2

<211> 18

<212> PRT

<213> Vespula vulgaris

<400> 2

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys

<210> 3

<211> 24

<212> PRT

<213> Vespula vulgaris

<400> 3

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Ser Leu Lys Pro
20

<210> 4

<211> 32

<212> PRT

<213> Vespula vulgaris

<400> 4

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Ser Leu Lys Pro Asn Cys Gly Asn Lys Val Val Val
20 25 30

<210> 5

<211> 39

<212> PRT

<213> Vespula vulgaris

<400> 5

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Ser Leu Lys Pro Asn Cys Gly Asn Lys Val Val Val
20 25 30

Ser Tyr Gly Leu Thr Lys Gln
35

<210> 6

<211> 46

<212> PRT

<213> Vespula vulgaris

<400> 6

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Ser Leu Lys Pro Asn Cys Gly Asn Lys Val Val Val
20 25 30

Ser Tyr Gly Leu Thr Lys Gln Glu Lys Gln Asp Ile Leu Lys
35 40 45

<210> 7

<211> 48

<212> PRT

<213> Vespula vulgaris

<400> 7

Gln Val Gly Gln Asn Val Ala Leu Thr Gly Ser Thr Ala Ala Lys Tyr
1 5 10 15

Asp Asp Pro Val Lys Leu Val Lys Met Trp Glu Asp Glu Val Lys Asp
20 25 30

Tyr Asn Pro Lys Lys Lys Phe Ser Gly Asn Asp Phe Leu Lys Thr Gly
35 40 45

<210> 8

<211> 49

<212> PRT

<213> Vespula vulgaris

<400> 8

His Tyr Thr Gln Met Val Trp Ala Asn Thr Lys Glu Val Gly Cys Gly
1 5 10 15

Ser Ile Lys Tyr Ile Gln Glu Lys Trp His Lys His Tyr Leu Val Cys
20 25 30

Asn Tyr Gly Pro Ser Gly Asn Phe Lys Asn Glu Glu Leu Tyr Gln Thr
35 40 45

Lys

<210> 9

<211> 11

<212> PRT

<213> Vespula vulgaris

<400> 9

Leu Lys Pro Asn Cys Gly Asn Lys Val Val Val
1 5 10

<210> 10

<211> 11

<212> PRT

<213> Vespula vulgaris

<400> 10

Leu Thr Gly Ser Thr Ala Ala Lys Tyr Asp Asp
1 5 10

<210> 11

<211> 9

<212> PRT

<213> Vespula vulgaris

<400> 11

Pro Lys Lys Lys Phe Ser Gly Asn Asp
1 5

<210> 12

<211> 7

<212> PRT

<213> Vespula vulgaris

<400> 12

Ile Gln Ile Lys Trp His Lys
1 5

<210> 13

<211> 10

<212> PRT

<213> Vespula vulgaris

<400> 13

Phe Lys Asn Glu Glu Leu Tyr Gln Thr Lys
1 5 10

<210> 14

<211> 615

<212> DNA

<213> Vespula vulgaris

<400> 14
aacaattatt gtaaaataaa atgtttgaaa ggaggtgtcc atactgcctg caaatatgga 60

agtcttaaac cgaattgcgg taataaggta gtggtatcct atggtctaac gaaacaagag 120

aaacaagaca tcttaaagga gcacaatgac tttagacaaa aaattgcacg aggattggag 180

actagaggta atcctggacc acagcctcca gcgaagaata tgaaaaattt ggtatggaac 240

gacgagttag cttatgtcgc ccaagtgtgg gctaatcaat gtcaatatgg tcacgatact 300

tgcagggatg tagcaaaata tcaggttgga caaaacgtag ccttaacagg tagcacggct 360

gctaaatacg atgatccagt taaactagtt aaaatgtggg aagatgaagt gaaagattat 420

aatcctaaga aaaagttttc gggaaacgac tttctgaaaa ccggccatta cactcaaatg 480

gtttgggcta acaccaagga agttggttgt ggaagtataa aatacattca agagaaatgg 540

cacaaacatt accttgtatg taattatgga cccagcggaa actttaagaa tgaggaactt 600

tatcaaacaa agtaa 615

<210> 15

<211> 618

<212> DNA

<213> Polistes annularis

<400> 15

gttgattatt gtaaaataaa gtgtccaagt ggtatccata cagtctgcca atatggagaa 60

tcgacaaaac caagcaagaa ttgtgccggt aaagtaatca aatcggttgg tccaacggaa 120

gaggagaaaa aattaatcgt aagcgagcat aatcggttta gacaaaaagt tgcacagggg 180

ttggaaacaa gaggtaatcc tggaccacaa cctgctgcct cggacatgaa tgatttggta 240

tggaacgatg aattagcaca tatcgcgcaa gtatgggcca gccaatgcca atttctcgta 300

cacgacaaat gcaggaatac cgcaaaatat ccagttggac aaaatatagc gtatgcaggt 360

ggttctaact taccagatgt agtcagtcta atcaaacttt gggaaaacga agtgaaagat 420

tttaattaca atacaggaat aacaaaacaa aactttgcta aaattggcca ttacactcaa 480

atggtttggg gtaaaactaa agaaattggt tgtggatctc taaaatatat ggaaaataat 540

atgcaaaatc attacctcat atgtaattat ggaccagctg gaaattactt gggtcaacta 600

ccttatacaa aaaaataa 618

<210> 16

<211> 204

<212> PRT

<213> Vespula vulgaris

<400> 16

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Ser Leu Lys Pro Asn Cys Gly Asn Lys Val Val Val
20 25 30

Ser Tyr Gly Leu Thr Lys Gln Glu Lys Gln Asp Ile Leu Lys Glu His
35 40 45

Asn Asp Phe Arg Gln Lys Ile Ala Arg Gly Leu Glu Thr Arg Gly Asn
50 55 60

Pro Gly Pro Gln Pro Pro Ala Lys Asn Met Lys Asn Leu Val Trp Asn
65 70 75 80

Asp Glu Leu Ala Tyr Val Ala Gln Val Trp Ala Asn Gln Cys Gln Tyr
85 90 95

Gly His Asp Thr Cys Arg Asp Val Ala Lys Tyr Gln Val Gly Gln Asn
100 105 110

Val Ala Leu Thr Gly Ser Thr Ala Ala Lys Tyr Asp Asp Pro Val Lys
115 120 125

Leu Val Lys Met Trp Glu Asp Glu Val Lys Asp Tyr Asn Pro Lys Lys
130 135 140

Lys Phe Ser Gly Asn Asp Phe Leu Lys Thr Gly His Tyr Thr Gln Met
145 150 155 160

Val Trp Ala Asn Thr Lys Glu Val Gly Cys Gly Ser Ile Lys Tyr Ile
165 170 175

Gln Glu Lys Trp His Lys His Tyr Leu Val Cys Asn Tyr Gly Pro Ser
180 185 190

Gly Asn Phe Lys Asn Glu Glu Leu Tyr Gln Thr Lys
195 200

<210> 17

<211> 205

<212> PRT

<213> Polistes annularis

<400> 17

Val Asp Tyr Cys Lys Ile Lys Cys Pro Ser Gly Ile His Thr Val Cys
1 5 10 15

Gln Tyr Gly Glu Ser Thr Lys Pro Ser Lys Asn Cys Ala Gly Lys Val

20 25 30

Ile Lys Ser Val Gly Pro Thr Glu Glu Glu Lys Lys Leu Ile Val Ser
35 40 45

Glu His Asn Arg Phe Arg Gln Lys Val Ala Gln Gly Leu Glu Thr Arg
50 55 60

Gly Asn Pro Gly Pro Gln Pro Ala Ala Ser Asp Met Asn Asp Leu Val
65 70 75 80

Trp Asn Asp Glu Leu Ala His Ile Ala Gln Val Trp Ala Ser Gln Cys
85 90 95

Gln Phe Leu Val His Asp Lys Cys Arg Asn Thr Ala Lys Tyr Pro Val
100 105 110

Gly Gln Asn Ile Ala Tyr Ala Gly Gly Ser Asn Leu Pro Asp Val Val
115 120 125

Ser Leu Ile Lys Leu Trp Glu Asn Glu Val Lys Asp Phe Asn Tyr Asn
130 135 140

Thr Gly Ile Thr Lys Gln Asn Phe Ala Lys Ile Gly His Tyr Thr Gln
145 150 155 160

Met Val Trp Gly Lys Thr Lys Glu Ile Gly Cys Gly Ser Leu Lys Tyr
165 170 175

Met Glu Asn Asn Met Gln Asn His Tyr Leu Ile Cys Asn Tyr Gly Pro
180 185 190

Ala Gly Asn Tyr Leu Gly Gln Leu Pro Tyr Thr Lys Lys
195 200 205

<210> 18

<211> 24

<212> DNA

<213> Vespula vulgaris

<400> 18
aacaattatt gtaaaataaa atgt 24

<210> 19

<211> 54

<212> DNA

<213> Vespula vulgaris

<400> 19
aacaattatt gtaaaataaa atgtttgaaa ggaggtgtcc atactgcctg caaa 54

<210> 20

<211> 72

<212> DNA

<213> Vespula vulgaris

<400> 20
aacaattatt gtaaaataaa atgtttgaaa ggaggtgtcc atactgcctg caaatatgga 60

agtcttaaac cg 72

<210> 21

<211> 96

<212> DNA

<213> Vespula vulgaris

<400> 21
aacaattatt gtaaaataaa atgtttgaaa ggaggtgtcc atactgcctg caaatatgga 60

agtcttaaac cgaattgcgg taataaggta gtggta 96

<210> 22

<211> 117

<212> DNA

<213> Vespula vulgaris

<400> 22
aacaattatt gtaaaataaa atgtttgaaa ggaggtgtcc atactgcctg caaatatgga 60

agtcttaaac cgaattgcgg taataaggta gtggtatcct atggtctaac gaaacaa 117

<210> 23

<211> 138

<212> DNA

<213> Vespula vulgaris

<400> 23
aacaattatt gtaaaataaa atgtttgaaa ggaggtgtcc atactgcctg caaatatgga 60

agtcttaaac cgaattgcgg taataaggta gtggtatcct atggtctaac gaaacaagag 120

aaacaagaca tcttaaag 138

<210> 24

<211> 144

<212> DNA

<213> Vespula vulgaris

<400> 24
caggttggac aaaacgtagc cttaacaggt agcacggctg ctaaatacga tgatccagtt 60

aaactagtta aaatgtggga agatgaagtg aaagattata atcctaagaa aaagttttcg 120

ggaaacgact ttctgaaaac cggc 144

<210> 25

<211> 147

<212> DNA

<213> Vespula vulgaris

<400> 25
cattacactc aaatggtttg ggctaacacc aaggaagttg gttgtggaag tataaaatac 60

attcaagaga aatggcacaa acattacctt gtatgtaatt atggacccag cggaaacttt 120

aagaatgagg aactttatca aacaaag 147

<210> 26

<211> 33

<212> DNA

<213> Vespula vulgaris

<400> 26
cttaaaccga attgcggtaa taaggtagtg gta 33

<210> 27

<211> 33

<212> DNA

<213> Vespula vulgaris

<400> 27
ttaacaggta gcacggctgc taaatacgat gat 33

<210> 28

<211> 27

<212> DNA

<213> Vespula vulgaris

<400> 28
cctaagaaaa agttttcggg aaacgac 27

<210> 29

<211> 21

<212> DNA

<213> Vespula vulgaris

<400> 29
attcaagaga aatggcacaa a 21

<210> 30

<211> 30

<212> DNA

<213> Vespula vulgaris

<400> 30
tttaagaatg aggaacttta tcaaacaaag 30

<210> 31

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Ves v 5' EA sense PCR primer 1

<400> 31
cgtgaattca acaattattg taaaataaaa 30

<210> 32

<211> 36

<212> DNA

<213> Artificial Sequence

<220>

<223> Ves v 5' KR sense PCR primer 2

<400> 32
cgtctcgaga aaagaaacaa ttattgtaaa ataaaa 36

<210> 33

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Ves v 3' downstream antisense PCR primer 3

<400> 33
cgttctagat tactttgttt gataaagttc 30

<210> 34

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Pol a 5' EA sense PCR primer 4

<400> 34
cgtgaattcg ttgattattg taaaataaaa 30

<210> 35

<211> 36

<212> DNA

<213> Artificial Sequence

<220>

<223> Pol a 5' KR sense PCR primer 5

<400> 35
cgtctcgaga aaagagttga ttattgtaaa ataaaa 36

<210> 36

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Pol a 3' downstream antisense primer 6

<400> 36
cgttctagat tatttttttg tataaggtag 30

<210> 37

<211> 21

<212> DNA

<213> Artificial Sequence

<220>

<223> Pol a aa 49-50 EH-mutagenic sense PCR primer 7

<400> 37
gtaagcgagc acaatcggtt t 21

<210> 38

<211> 21

<212> DNA

<213> Artificial Sequence

<220>

<223> Pol a aa 49-50 EH-mutagenic antisense PCR primer 8

<400> 38
aaaccgattg tgctcgctta c 21

<210> 39

<211> 21

<212> DNA

<213> Artificial Sequence

<220>

<223> Ves v ApoI conversion PCR primer 9

<400> 39
gtagcaaaat ttcaggttgg a 21

<210> 40

<211> 21

<212> DNA

<213> Artificial Sequence

<220>

<223> Ves v ApoI conversion PCR primer 10

<400> 40
tccaacctga aattttgcta c 21

<210> 41

<211> 21

<212> DNA

<213> Artificial Sequence

<220>

<223> Pol a ApoI conversion PCR primer 11

<400> 41
accgcaaaat ttccagttgg a 21

<210> 42

<211> 21

<212> DNA

<213> Artificial Sequence

<220>

<223> Pol a ApoI conversion PCR primer 12

<400> 42
tccaactgga aattttgcgg t 21

<210> 43

<211> 72

<212> DNA

<213> Artificial Sequence

<220>

<223> PV1-18 sense PCR primer 13

<400> 43
cgtgaattca acaattattg taaaataaaa tgtttgaaag gaggtgtcca tactgcctgc 60

aaatatggag aa 72

<210> 44

<211> 54

<212> DNA

<213> Artificial Sequence

<220>

<223> PV195-204 antisense PCR primer 14

<400> 44
cgttctagat tactttgttt gataaagttc ctcattctta aaatttccag ctgg 54

<210> 45

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> PV18-24 and PV1-24 antisense PCR primer 15

<400> 45
ggcacaattc ttgctcggtt taagacttcc ata 33

<210> 46

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> PV18-24 and PV 1-24 sense PCR primer 16

<400> 46
tatggaagtc ttaaaccgag caagaattgt gcc 33

<210> 47

<211> 45

<212> DNA

<213> Artificial Sequence

<220>

<223> PV22-32 and PV1-32 sense PCR primer 17

<400> 47
cttaaaccga attgcggtaa taaggtagtg gtatcggttg gtcca 45

<210> 48

<211> 45

<212> DNA

<213> Artificial Sequence

<220>

<223> PV22-32 and PV1-32 antisense PCR primer 18

<400> 48
tggaccaacc gataccacta ccttattacc gcaattcggt ttaag 45

<210> 49

<211> 36

<212> DNA

<213> Artificial Sequence

<220>

<223> PV1-39 PCR primer 19

<400> 49
tatggtctaa cgaaacaaga gaaaaaatta atcgta 36

<210> 50

<211> 36

<212> DNA

<213> Artificial Sequence

<220>

<223> PV1-39 PCR primer 20

<400> 50
tacgattaat tttttctctt gtttcgttag accata 36

<210> 51

<211> 45

<212> DNA

<213> Artificial Sequence

<220>

<223> PV115-125 sense PCR primer 21

<400> 51
ttaacaggta gcacggctgc taaatacgat gatgtagtca gtcta 45

<210> 52

<211> 45

<212> DNA

<213> Artificial Sequence

<220>

<223> PV115-125 antisense PCR primer 22

<400> 52
atcatcgtat ttagcagccg tgctacctgt taacgctata ttttg 45

<210> 53

<211> 42

<212> DNA

<213> Artificial Sequence

<220>

<223> PV142-150 sense PCR primer 23

<400> 53
cctaagaaaa agttttcggg aaacgacttt gctaaaattg gc 42

<210> 54

<211> 42

<212> DNA

<213> Artificial Sequence

<220>

<223> PV142-150 antisense PCR primer 24

<400> 54
gtcgtttccc gaaaactttt tcttaggatt aaaatctttc ac 42

<210> 55

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> PV176-182 sense PCR primer 25

<400> 55
attcaagaga aatggcacaa acattacctc ata 33

<210> 56

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> PV176-182 antisense PCR primer 26

<400> 56
tttgtgccat ttctcttgaa tatattttag aga 33

<210> 57

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> PV1-50 antisense PCR primer 27

<400> 57
gagcacaatg actttagaca aaaa 24

<210> 58

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> PV1-57 antisense PCR primer 28

<400> 58
tttttgtcta aagtcattgt gctc 24

<210> 59

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> PV1-76 antisense PCR primer 29

<400> 59
aaaattgcac gagggttgga aaca 24

<210> 60

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> PCR primer

<400> 60
tgtttccaac cctcgtgcaa tttt 24

<210> 61

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> PCR primer

<400> 61
aatatgaaaa atttggtatg gaac 24

<210> 62

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> PCR primer

<400> 62
gttccatacc aaatttttca tatt 24

<210> 63

<211> 204

<212> PRT

<213> Vespula maculifrons

<400> 63

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Ser Leu Lys Pro Asn Cys Gly Asn Lys Lys Val Val
20 25 30

Ser Tyr Gly Leu Thr Lys Gln Glu Lys Gln Asp Ile Leu Lys Glu His
35 40 45

Asn Asp Phe Arg Gln Lys Ile Ala Arg Gly Leu Glu Thr Arg Gly Asn
50 55 60

Pro Gly Pro Gln Pro Pro Ala Lys Asn Met Lys Asn Leu Val Trp Ser
65 70 75 80

Asp Glu Leu Ala Tyr Ile Ala Gln Val Trp Ala Asn Gln Cys Gln Tyr
85 90 95

Gly His Asp Thr Cys Arg Asp Val Ala Lys Tyr Gln Val Gly Gln Asn
100 105 110

Val Ala Leu Thr Gly Ser Thr Ala Ala Val Tyr Asn Asp Pro Val Lys
115 120 125

Leu Val Lys Met Trp Glu Asp Glu Val Lys Asp Tyr Asn Pro Lys Lys
130 135 140

Lys Phe Ser Glu Asn Asn Phe Leu Lys Ile Gly His Tyr Thr Gln Met
145 150 155 160

Val Trp Ala Asn Thr Lys Glu Val Gly Cys Gly Ser Ile Lys Tyr Ile
165 170 175

Gln Glu Asn Trp His Lys His Tyr Leu Val Cys Asn Tyr Gly Pro Ser

180 185 190

Gly Asn Phe Gln Asn Glu Glu Leu Tyr Gln Thr Lys
195 200

<210> 64

<211> 204

<212> PRT

<213> Vespula vulgaris

<400> 64

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Ser Leu Lys Pro Asn Cys Gly Asn Lys Val Val Val
20 25 30

Ser Tyr Gly Leu Thr Lys Gln Glu Lys Gln Asp Ile Leu Lys Glu His
35 40 45

Asn Asp Phe Arg Gln Lys Ile Ala Arg Gly Leu Glu Thr Arg Gly Asn
50 55 60

Pro Gly Pro Gln Pro Pro Ala Lys Asn Met Lys Asn Leu Val Trp Asn
65 70 75 80

Asp Glu Leu Ala Tyr Val Ala Gln Val Trp Ala Asn Gln Cys Gln Tyr
85 90 95

Gly His Asp Thr Cys Arg Asp Val Ala Lys Tyr Gln Val Gly Gln Asn
100 105 110

Val Ala Leu Thr Gly Ser Thr Ala Ala Lys Tyr Asp Asp Pro Val Lys
115 120 125

Leu Val Lys Met Trp Glu Asp Glu Val Lys Asp Tyr Asn Pro Lys Lys
130 135 140

Lys Phe Ser Gly Asn Asp Phe Leu Lys Thr Gly His Tyr Thr Gln Met
145 150 155 160

Val Trp Ala Asn Thr Lys Glu Val Gly Cys Gly Ser Ile Lys Tyr Ile
165 170 175

Gln Glu Lys Trp His Lys His Tyr Leu Val Cys Asn Tyr Gly Pro Ser
180 185 190

Gly Asn Phe Met Asn Glu Glu Leu Tyr Gln Thr Lys
195 200

<210> 65

<211> 204

<212> PRT

<213> Vespula flavopilosa

<400> 65

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Ser Leu Lys Pro Asn Cys Gly Asn Lys Val Val Val
20 25 30

Ser Tyr Gly Leu Thr Lys Gln Glu Lys Gln Asp Ile Leu Lys Glu His
35 40 45

Asn Asp Phe Arg Gln Lys Ile Ala Arg Gly Leu Glu Thr Arg Gly Asn
50 55 60

Pro Gly Pro Gln Pro Pro Ala Lys Asn Met Lys Asn Leu Val Trp Asn
65 70 75 80

Asp Glu Leu Ala Tyr Val Ala Gln Val Trp Ala Asn Gln Cys Gln Tyr
85 90 95

Gly His Asp Thr Cys Arg Asp Ile Ala Lys Tyr Gln Val Gly Gln Asn
100 105 110

Val Ala Leu Thr Gly Ser Thr Ala Ala Lys Tyr Asp Asp Pro Val Lys
115 120 125

Leu Val Lys Met Trp Glu Asp Glu Val Lys Asp Tyr Asn Pro Lys Lys
130 135 140

Lys Phe Ser Gly Asn Asn Phe Leu Lys Thr Gly His Tyr Thr Gln Met
145 150 155 160

Val Trp Ala Asn Thr Lys Glu Val Gly Cys Gly Ser Ile Lys Phe Ile
165 170 175

Gln Glu Lys Trp His Lys His Tyr Leu Val Cys Asn Tyr Gly Pro Ser
180 185 190

Gly Asn Phe Gln Asn Glu Glu Leu Tyr Gln Thr Lys
195 200

<210> 66

<211> 204

<212> PRT

<213> Vespula pensylvanica

<400> 66

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Ser Leu Lys Pro Asn Cys Gly Asn Lys Ile Val Val
20 25 30

Ser Tyr Gly Leu Thr Lys Glu Glu Lys Gln Asp Ile Leu Lys Glu His
35 40 45

Asn Asp Phe Arg Gln Lys Ile Ala Arg Gly Leu Glu Thr Arg Gly Asn
50 55 60

Pro Gly Pro Gln Pro Pro Ala Lys Asn Met Lys Asn Leu Val Trp Asn
65 70 75 80

Asp Glu Leu Ala Tyr Val Ala Gln Val Trp Ala Asn Gln Cys Gln Tyr
85 90 95

Gly His Asp Thr Cys Arg Asp Val Ala Lys Tyr Pro Val Gly Gln Asn
100 105 110

Val Ala Leu Thr Gly Ser Thr Ala Asp Lys Tyr Asp Asn Pro Val Lys
115 120 125

Leu Val Lys Met Trp Glu Asp Glu Val Lys Asp Tyr Asn Pro Lys Lys
130 135 140

Lys Phe Ser Glu Asn Asn Phe Asn Lys Ile Gly His Tyr Thr Gln Met
145 150 155 160

Val Trp Ala Asn Thr Lys Glu Ile Gly Cys Gly Ser Ile Lys Tyr Ile
165 170 175

Gln Asn Glu Trp His Lys His Tyr Leu Val Cys Asn Tyr Gly Pro Ser
180 185 190

Gly Asn Phe Gly Asn Glu Glu Leu Tyr Gln Thr Lys
195 200

<210> 67

<211> 204

<212> PRT

<213> Vespula germanica

<400> 67

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Glu Ser Leu Lys Pro Asn Cys Ala Asn Lys Lys Val Val
20 25 30

Ala Tyr Gly Leu Thr Lys Gln Glu Lys Gln Asp Ile Leu Lys Glu His
35 40 45

Asn Asp Phe Arg Gln Lys Ile Ala Arg Gly Leu Glu Thr Arg Gly Asn
50 55 60

Pro Gly Pro Gln Pro Pro Ala Lys Asn Met Lys Asn Leu Val Trp Ser
65 70 75 80

Asp Glu Leu Ala Tyr Ile Ala Gln Val Trp Ala Asn Gln Cys Gln Tyr
85 90 95

Gly His Asp Thr Cys Arg Asp Val Ala Lys Tyr Pro Val Gly Gln Asn
100 105 110

Val Ala Leu Thr Gly Ser Thr Ala Ala Lys Tyr Asp Asn Pro Val Lys
115 120 125

Leu Val Lys Met Trp Glu Asp Glu Val Lys Asp Tyr Asn Pro Lys Lys
130 135 140

Lys Phe Ser Glu Asn Asn Phe Leu Lys Ile Gly His Tyr Thr Gln Met
145 150 155 160

Val Trp Ala Asn Thr Lys Glu Val Gly Cys Gly Ser Ile Lys Tyr Ile

165 170 175

Gln Asp Lys Trp His Lys His Tyr Leu Val Cys Asn Tyr Gly Pro Ser
180 185 190

Gly Asn Phe Gly Asn Glu Glu Leu Tyr Gln Thr Lys
195 200

<210> 68

<211> 206

<212> PRT

<213> Vespula vidua

<400> 68

Lys Val Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr
1 5 10 15

Ala Cys Lys Tyr Gly Thr Ser Thr Lys Pro Asn Cys Gly Lys Met Val
20 25 30

Val Lys Ala Tyr Gly Leu Thr Glu Ala Glu Lys Gln Glu Ile Leu Lys
35 40 45

Val His Asn Asp Phe Arg Gln Lys Val Ala Lys Gly Leu Glu Thr Arg
50 55 60

Gly Asn Pro Gly Pro Gln Pro Pro Ala Lys Asn Met Asn Asn Leu Val
65 70 75 80

Trp Asn Asp Glu Leu Ala Asn Ile Ala Gln Val Trp Ala Ser Gln Cys
85 90 95

Asn Tyr Gly His Asp Thr Cys Lys Asp Thr Glu Lys Tyr Pro Val Gly
100 105 110

Gln Asn Ile Ala Lys Arg Ser Thr Thr Ala Ala Leu Phe Asp Ser Pro
115 120 125

Gly Lys Leu Val Lys Met Trp Glu Asn Glu Val Lys Asp Phe Asn Pro
130 135 140

Asn Ile Glu Trp Ser Lys Asn Asn Leu Lys Lys Thr Gly His Tyr Thr
145 150 155 160

Gln Met Val Trp Ala Lys Thr Lys Glu Ile Gly Cys Gly Ser Val Lys
165 170 175

Tyr Val Lys Asp Glu Trp Tyr Thr His Tyr Leu Val Cys Asn Tyr Gly
180 185 190

Pro Ser Gly Asn Phe Arg Asn Glu Lys Leu Tyr Glu Lys Lys
195 200 205

<210> 69

<211> 205

<212> PRT

<213> Vespula squamosa

<400> 69

Val Asp Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Thr Ser Thr Lys Pro Asn Cys Gly Asn Met Val Val
20 25 30

Lys Ser Tyr Gly Val Thr Gln Ala Glu Lys Gln Glu Ile Leu Lys Ile
35 40 45

His Asn Asp Phe Arg Asn Lys Val Ala Arg Gly Leu Glu Thr Arg Gly
50 55 60

Asn Pro Gly Pro Gln Pro Pro Ala Lys Asn Met Asn Asn Leu Val Trp
65 70 75 80

Asn Asn Glu Leu Ala Asn Ile Ala Gln Ile Trp Ala Ser Gln Cys Lys
85 90 95

Tyr Gly His Asp Thr Cys Lys Asp Thr Thr Lys Tyr Asn Val Gly Gln
100 105 110

Asn Ile Ala Val Ser Ser Ser Thr Ala Ala Val Tyr Glu Asn Val Gly
115 120 125

Asn Leu Val Lys Ala Trp Glu Asn Glu Val Lys Asp Phe Asn Pro Thr
130 135 140

Ile Ser Trp Glu Gln Asn Glu Phe Lys Lys Ile Gly His Tyr Thr Gln
145 150 155 160

Met Val Trp Ala Lys Thr Lys Glu Ile Gly Cys Gly Ser Ile Lys Tyr
165 170 175

Val Asp Asn Asn Trp Tyr Thr His Tyr Leu Val Cys Asn Tyr Gly Pro
180 185 190

Ala Gly Asn Phe Gly Asn Gln Glu Val Tyr Glu Arg Lys
195 200 205

<210> 70

<211> 204

<212> PRT

<213> Dolichovespula maculata

<400> 70

Asn Asn Tyr Cys Lys Ile Lys Cys Arg Lys Gly Ile His Thr Leu Cys
1 5 10 15

Lys Phe Gly Thr Ser Met Lys Pro Asn Cys Gly Arg Asn Val Val Lys
20 25 30

Ala Tyr Gly Leu Thr Asn Asp Glu Lys Asn Glu Ile Leu Lys Arg His
35 40 45

Asn Asp Phe Arg Gln Asn Val Ala Lys Gly Leu Glu Thr Arg Gly Lys
50 55 60

Pro Gly Pro Gln Pro Pro Ala Lys Asn Met Asn Val Leu Val Trp Asn
65 70 75 80

Asp Glu Leu Ala Lys Ile Ala Gln Thr Trp Ala Asn Gln Cys Asp Phe
85 90 95

Asn His Asp Asp Cys Arg Asn Thr Ala Lys Tyr Gln Val Gly Gln Asn
100 105 110

Ile Ala Ile Ser Ser Thr Thr Ala Thr Gln Phe Asp Arg Pro Ser Lys
115 120 125

Leu Ile Lys Gln Trp Glu Asp Glu Val Thr Glu Phe Asn Tyr Lys Val
130 135 140

Gly Leu Gln Asn Ser Asn Phe Arg Lys Val Gly His Tyr Thr Gln Met
145 150 155 160

Val Trp Gly Lys Thr Lys Glu Ile Gly Cys Gly Ser Ile Lys Tyr Ile
165 170 175

Glu Asp Asn Trp Tyr Thr His Tyr Leu Val Cys Asn Tyr Gly Pro Gly
180 185 190

Gly Asn Asp Phe Asn Gln Pro Ile Tyr Glu Arg Lys
195 200

<210> 71

<211> 203

<212> PRT

<213> Dolichovespula arenaria

<400> 71

Asn Asn Tyr Cys Lys Ile Cys Pro Lys Gly Thr His Thr Leu Cys Lys
1 5 10 15

Tyr Gly Thr Ser Met Lys Pro Asn Cys Gly Gly Lys Ile Val Lys Ser
20 25 30

Tyr Gly Val Thr Asn Asp Glu Lys Asn Glu Ile Val Lys Arg His Asn
35 40 45

Glu Phe Arg Gln Lys Val Ala Gln Gly Leu Glu Thr Arg Gly Asn Pro
50 55 60

Gly Pro Gln Pro Pro Ala Lys Asn Met Asn Leu Leu Val Trp Asn Asp
65 70 75 80

Glu Leu Ala Lys Ile Ala Gln Thr Trp Ala Asn Gln Cys Asn Phe Gly
85 90 95

His Asp Gln Cys Arg Asn Thr Ala Lys Tyr Pro Val Gly Gln Asn Val
100 105 110

Ala Ile Ala Ser Thr Thr Gly Asn Ser Tyr Gln Thr Met Ser Tyr Leu
115 120 125

Ile Lys Met Trp Glu Asp Glu Val Lys Asp Tyr Asn Pro His Lys Asp
130 135 140

Leu Met His Asn Asn Phe Ser Lys Val Gly His Tyr Thr Gln Met Val

145 150 155 160

Trp Gly Lys Thr Lys Glu Ile Gly Cys Gly Ser Val Lys Tyr Ile Glu
165 170 175

Asn Lys Trp His Thr His Tyr Leu Val Cys Asn Tyr Gly Pro Ala Gly
180 185 190

Asn Tyr Met Asn Gln Pro Val Tyr Glu Arg Lys
195 200

<210> 72

<211> 205

<212> PRT

<213> Dolichovespula maculata

<400> 72

Asn Asn Tyr Cys Lys Ile Lys Cys Ser Arg Gly Ile His Thr Leu Cys
1 5 10 15

Lys Phe Gly Thr Ser Met Lys Pro Asn Cys Gly Ser Lys Leu Val Lys
20 25 30

Val His Gly Val Ser Asn Asp Glu Lys Asn Glu Ile Val Asn Arg His
35 40 45

Asn Gln Phe Arg Gln Lys Val Ala Lys Gly Leu Glu Thr Arg Gly Asn
50 55 60

Pro Gly Pro Gln Pro Pro Ala Lys Asn Met Asn Val Leu Val Trp Asn
65 70 75 80

Asp Glu Leu Ala Lys Ile Ala Gln Thr Trp Ala Asn Gln Cys Ser Phe
85 90 95

Gly His Asp Gln Cys Arg Asn Thr Glu Lys Tyr Gln Val Gly Gln Asn
100 105 110

Val Ala Ile Ala Ser Thr Thr Gly Asn Ser Tyr Ala Thr Met Ser Lys
115 120 125

Leu Ile Glu Met Trp Glu Asn Glu Val Lys Asp Phe Asn Pro Lys Lys
130 135 140

Gly Thr Met Gly Asp Asn Asn Phe Ser Lys Val Gly His Tyr Thr Gln
145 150 155 160

Met Val Trp Gly Lys Thr Lys Glu Ile Gly Cys Gly Ser Val Lys Tyr
165 170 175

Ile Glu Asn Asn Trp His Thr His Tyr Leu Val Cys Asn Tyr Gly Pro
180 185 190

Ala Gly Asn Tyr Met Asp Gln Pro Ile Tyr Glu Arg Lys
195 200 205

<210> 73

<211> 202

<212> PRT

<213> Vespa mandarinia

<400> 73

Asn Asn Tyr Cys Lys Ile Lys Cys Arg Ser Gly Ile His Thr Leu Cys
1 5 10 15

Lys Phe Gly Ile Ser Thr Lys Pro Asn Cys Gly Lys Asn Val Val Lys
20 25 30

Ala Ser Gly Leu Thr Lys Ala Glu Lys Leu Glu Ile Leu Lys Gln His
35 40 45

Asn Glu Phe Arg Gln Lys Val Ala Arg Gly Leu Glu Thr Arg Gly Lys
50 55 60

Pro Gly Pro Gln Pro Pro Ala Lys Ser Met Asn Thr Leu Val Trp Asn
65 70 75 80

Asp Glu Leu Ala Gln Ile Ala Gln Val Trp Ala Gly Gln Cys Asp Tyr
85 90 95

Gly His Asp Val Cys Arg Asn Thr Ala Lys Tyr Ser Val Gly Gln Asn
100 105 110

Ile Ala Glu Asn Gly Ser Thr Ala Ala Ser Phe Ala Ser Val Ser Asn
115 120 125

Met Val Gln Met Trp Ala Asp Glu Val Lys Asn Tyr Gln Tyr Gly Ser
130 135 140

Thr Lys Asn Lys Leu Ile Glu Val Gly His Tyr Thr Gln Met Val Trp
145 150 155 160

Ala Lys Thr Lys Glu Ile Gly Cys Gly Ser Ile Lys Tyr Ile Glu Asn
165 170 175

Gly Trp His Arg His Tyr Leu Val Cys Asn Tyr Gly Pro Ala Gly Asn
180 185 190

Ile Gly Asn Glu Pro Ile Tyr Glu Arg Lys
195 200

<210> 74

<211> 202

<212> PRT

<213> Vespa crabro

<400> 74

Asn Asn Tyr Cys Lys Ile Lys Cys Arg Ser Gly Ile His Thr Leu Cys
1 5 10 15

Lys Tyr Gly Thr Ser Thr Lys Pro Asn Cys Gly Lys Asn Val Val Lys
20 25 30

Ala Ser Gly Leu Thr Lys Gln Glu Asn Leu Glu Ile Leu Lys Gln His
35 40 45

Asn Glu Phe Arg Gln Lys Val Ala Arg Gly Leu Glu Thr Arg Gly Asn
50 55 60

Pro Gly Pro Gln Pro Pro Ala Lys Ser Met Asn Thr Leu Val Trp Asn
65 70 75 80

Asp Glu Leu Ala Gln Ile Ala Gln Val Trp Ala Asn Gln Cys Asn Tyr
85 90 95

Gly His Asp Asn Cys Arg Asn Ser Ala Lys Tyr Ser Val Gly Gln Asn
100 105 110

Ile Ala Glu Gly Ser Thr Thr Ala Asp Asn Phe Gly Ser Val Ser Asn
115 120 125

Met Val Lys Met Trp Glu Asp Glu Val Lys Asp Tyr Gln Tyr Gly Ser
130 135 140

```
Pro Lys Asn Lys Leu Asn Lys Val Gly His Tyr Thr Gln Met Val Trp
145                 150                 155                 160

Ala Lys Thr Lys Glu Ile Gly Cys Gly Ser Ile Lys Tyr Ile Glu Asn
                165                 170                 175

Gly Trp His Arg His Tyr Leu Val Cys Asn Tyr Gly Pro Ala Gly Asn
            180                 185                 190

Val Gly Asn Glu Pro Ile Tyr Glu Arg Lys
        195                 200
```

<210> 75

<211> 202

<212> PRT

<213> Vespa crabro

<400> 75

```
Asn Asn Tyr Cys Lys Ile Lys Cys Arg Ser Gly Ile His Thr Leu Cys
1               5                   10                  15

Lys Tyr Gly Thr Ser Thr Lys Pro Asn Cys Gly Lys Asn Val Val Lys
            20                  25                  30

Ala Ser Gly Leu Thr Lys Gln Glu Asn Leu Glu Ile Leu Lys Gln His
        35                  40                  45

Asn Glu Phe Arg Gln Lys Val Ala Arg Gly Leu Glu Thr Arg Gly Asn
    50                  55                  60

Pro Gly Pro Gln Pro Pro Ala Lys Ser Met Asn Thr Leu Val Trp Asn
65                  70                  75                  80

Asp Glu Leu Ala Gln Ile Ala Gln Val Trp Ala Asn Gln Cys Asn Tyr
                85                  90                  95

Gly His Asp Asn Cys Arg Asn Ser Ala Lys Tyr Ser Val Gly Gln Asn
            100                 105                 110

Ile Ala Glu Gly Ser Thr Ser Ala Asp Asn Phe Val Asn Val Ser Asn
        115                 120                 125

Met Val Lys Met Trp Glu Asp Glu Val Lys Asp Tyr Gln Tyr Gly Ser
```

130 135 140

Pro Lys Asn Lys Leu Asn Lys Val Gly His Tyr Thr Gln Met Val Trp
145 150 155 160

Ala Lys Thr Lys Glu Ile Gly Cys Gly Ser Glu Asp Tyr Ile Glu Asp
165 170 175

Gly Trp His Arg His Tyr Leu Val Cys Asn Tyr Gly Pro Ala Gly Asn
180 185 190

Val Gly Asn Glu Pro Ile Tyr Glu Arg Lys
195 200

<210> 76

<211> 205

<212> PRT

<213> Polistes fuscatus

<400> 76

Val Asp Tyr Cys Lys Ile Lys Cys Ser Ser Gly Ile His Thr Val Cys
1 5 10 15

Gln Tyr Gly Glu Ser Thr Lys Pro Ser Lys Asn Cys Ala Asp Lys Val
20 25 30

Ile Lys Ser Val Gly Pro Thr Glu Glu Glu Lys Lys Leu Ile Val Asn
35 40 45

Glu His Asn Arg Phe Arg Gln Lys Val Ala Gln Gly Leu Glu Thr Arg
50 55 60

Gly Asn Pro Gly Pro Gln Pro Ala Ala Ser Asp Met Asn Asn Leu Val
65 70 75 80

Trp Asn Asp Glu Leu Ala His Ile Ala Gln Val Trp Ala Ser Gln Cys
85 90 95

Gln Ile Leu Val His Asp Lys Cys Arg Asn Thr Ala Lys Tyr Gln Val
100 105 110

Gly Gln Asn Ile Ala Tyr Ala Gly Gly Ser Lys Leu Pro Asp Val Val
115 120 125

Ser Leu Ile Lys Leu Trp Glu Asn Glu Val Lys Asp Phe Asn Tyr Asn
130 135 140

Lys Gly Ile Thr Lys Gln Asn Phe Gly Lys Val Gly His Tyr Thr Gln
145 150 155 160

Met Ile Trp Ala Lys Thr Lys Glu Ile Gly Cys Gly Ser Leu Lys Tyr
165 170 175

Met Lys Asn Asn Met Gln His His Tyr Leu Ile Cys Asn Tyr Gly Pro
180 185 190

Ala Gly Asn Tyr Leu Gly Gln Leu Pro Tyr Thr Lys Lys
195 200 205

<210> 77

<211> 205

<212> PRT

<213> Polistes exclamans

<400> 77

Val Asp Tyr Cys Lys Ile Lys Cys Pro Ser Gly Ile His Thr Val Cys
1 5 10 15

Gln Tyr Gly Glu Ser Thr Lys Pro Ser Lys Asn Cys Ala Gly Lys Val
20 25 30

Ile Lys Ser Val Gly Pro Thr Glu Glu Glu Lys Lys Leu Ile Val Ser
35 40 45

Glu His Asn Arg Phe Arg Gln Lys Val Ala Gln Gly Leu Glu Thr Arg
50 55 60

Gly Asn Pro Gly Pro Gln Pro Ala Ala Ser Asp Met Asn Asp Leu Val
65 70 75 80

Trp Asn Asp Glu Leu Ala His Ile Ala Gln Val Trp Ala Ser Gln Cys
85 90 95

Gln Phe Leu Val His Asp Lys Cys Arg Asn Thr Ala Lys Tyr Pro Val
100 105 110

Gly Gln Asn Ile Ala Tyr Ala Gly Gly Ser Lys Leu Pro Asp Val Val
115 120 125

```
Ser Leu Ile Lys Leu Trp Glu Asn Glu Val Lys Asp Phe Asn Tyr Asn
    130                 135                 140

Thr Gly Ile Thr Lys Gln Asn Phe Ala Lys Ile Gly His Tyr Thr Gln
145                 150                 155                 160

Met Val Trp Gly Lys Thr Lys Glu Ile Gly Cys Gly Ser Leu Lys Tyr
                165                 170                 175

Ile Glu Asn Lys Met Gln Asn His Tyr Leu Ile Cys Asn Tyr Gly Pro
            180                 185                 190

Ala Gly Asn Tyr Leu Gly Gln Leu Pro Tyr Thr Lys Lys
        195                 200                 205
```

<210> 78

<211> 205

<212> PRT

<213> Polistes annularis

<400> 78

```
Val Asp Tyr Cys Lys Ile Lys Cys Pro Ser Gly Ile His Thr Val Cys
1               5                   10                  15

Gln Tyr Gly Glu Ser Thr Lys Pro Ser Lys Asn Cys Ala Gly Lys Val
            20                  25                  30

Ile Lys Ser Val Gly Pro Thr Glu Glu Glu Lys Lys Leu Ile Val Ser
        35                  40                  45

Glu His Asn Arg Phe Arg Gln Lys Val Ala Gln Gly Leu Glu Thr Arg
    50                  55                  60

Gly Asn Pro Gly Pro Gln Pro Ala Ala Ser Asp Met Asn Asp Leu Val
65                  70                  75                  80

Trp Asn Asp Glu Leu Ala His Ile Ala Gln Val Trp Ala Ser Gln Cys
                85                  90                  95

Gln Phe Leu Val His Asp Lys Cys Arg Asn Thr Ala Lys Tyr Pro Val
            100                 105                 110

Gly Gln Asn Ile Ala Tyr Ala Gly Gly Ser Asn Leu Pro Asp Val Val
        115                 120                 125
```

Ser Leu Ile Lys Leu Trp Glu Asn Glu Val Lys Asp Phe Asn Tyr Asn
130 135 140

Thr Gly Ile Thr Lys Gln Asn Phe Ala Lys Ile Gly His Tyr Thr Gln
145 150 155 160

Met Val Trp Gly Lys Thr Lys Glu Ile Gly Cys Gly Ser Leu Lys Tyr
165 170 175

Met Glu Asn Asn Met Gln Asn His Tyr Leu Ile Cys Asn Tyr Gly Pro
180 185 190

Ala Gly Asn Tyr Leu Gly Gln Leu Pro Tyr Thr Lys Lys
195 200 205

<210> 79

<211> 212

<212> PRT

<213> Solenopsis invicta

<400> 79

Thr Asn Tyr Cys Asn Leu Gln Ser Cys Lys Arg Asn Asn Ala Ile His
1 5 10 15

Thr Met Cys Gln Tyr Thr Ser Pro Thr Pro Gly Pro Met Cys Leu Glu
20 25 30

Tyr Ser Asn Val Gly Phe Thr Asp Ala Glu Lys Asp Ala Ile Val Asn
35 40 45

Lys His Asn Glu Leu Arg Gln Arg Val Ala Ser Gly Lys Glu Met Arg
50 55 60

Gly Thr Asn Gly Pro Gln Pro Pro Ala Val Lys Met Pro Asn Leu Thr
65 70 75 80

Trp Asp Pro Glu Leu Ala Thr Ile Ala Gln Arg Trp Ala Asn Gln Cys
85 90 95

Thr Phe Glu His Asp Ala Cys Arg Asn Val Glu Arg Phe Ala Val Gly
100 105 110

Gln Asn Ile Ala Ala Thr Ser Ser Ser Gly Lys Asn Lys Ser Thr Pro

115 120 125

Asn Glu Met Ile Leu Leu Trp Tyr Asn Glu Val Lys Asp Phe Asp Asn
130 135 140

Arg Trp Ile Ser Ser Phe Pro Ser Asp Asp Asn Ile Leu Met Lys Val
145 150 155 160

Glu His Tyr Thr Gln Ile Val Trp Ala Lys Thr Ser Lys Ile Gly Cys
165 170 175

Ala Arg Ile Met Phe Lys Glu Pro Asp Asn Trp Thr Lys His Tyr Leu
180 185 190

Val Cys Asn Tyr Gly Pro Ala Gly Asn Val Leu Gly Ala Pro Ile Tyr
195 200 205

Glu Ile Lys Lys
210

<210> 80

<211> 211

<212> PRT

<213> Solenopsis richteri

<400> 80

Thr Asn Tyr Cys Asn Leu Gln Ser Cys Lys Arg Asn Asn Ala Ile His
1 5 10 15

Thr Met Cys Gln Tyr Thr Ser Pro Thr Pro Gly Pro Met Cys Leu Glu
20 25 30

Tyr Ser Asn Val Gly Phe Thr Asp Ala Glu Lys Asp Ala Ile Val Asn
35 40 45

Lys His Asn Glu Leu Arg Gln Arg Val Ala Ser Gly Lys Glu Met Arg
50 55 60

Gly Thr Asn Gly Pro Gln Pro Pro Ala Val Lys Met Pro Asn Leu Thr
65 70 75 80

Trp Asp Pro Glu Leu Ala Thr Ile Ala Gln Arg Trp Ala Asn Gln Cys
85 90 95

Thr Phe Glu His Asp Ala Cys Arg Asn Val Glu Arg Phe Ala Val Gly
100 105 110

Gln Asn Ile Ala Ala Thr Ser Ser Ser Gly Lys Asn Lys Ser Thr Leu
115 120 125

Ser Asp Met Ile Leu Leu Trp Tyr Asn Glu Val Lys Asp Phe Asp Asn
130 135 140

Arg Trp Ile Ser Ser Phe Pro Ser Asp Gly Asn Ile Leu Met His Val
145 150 155 160

Gly His Tyr Thr Gln Ile Val Trp Ala Lys Thr Lys Lys Ile Gly Cys
165 170 175

Gly Arg Ile Met Phe Lys Glu Asp Asn Trp Asn Lys His Tyr Leu Val
180 185 190

Cys Asn Tyr Gly Pro Ala Gly Asn Val Leu Gly Ala Gln Ile Tyr Glu
195 200 205

Ile Lys Lys
210

<210> 81

<211> 204

<212> PRT

<213> Vespula vulgaris

<400> 81

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Ser Leu Lys Pro Asn Cys Gly Asn Lys Val Val Val
20 25 30

Ser Tyr Gly Leu Thr Lys Gln Glu Lys Gln Asp Ile Leu Lys Glu His
35 40 45

Asn Asp Phe Arg Gln Lys Ile Ala Arg Gly Leu Glu Thr Arg Gly Asn
50 55 60

Pro Gly Pro Gln Pro Pro Ala Lys Asn Met Lys Asn Leu Val Trp Asn
65 70 75 80

```
Asp Glu Leu Ala Tyr Val Ala Gln Val Trp Ala Asn Gln Cys Gln Tyr
                85                  90                  95

Gly His Asp Thr Cys Arg Asp Val Ala Lys Tyr Gln Val Gly Gln Asn
            100                 105                 110

Val Ala Leu Thr Gly Ser Thr Ala Ala Lys Tyr Asp Asp Pro Val Lys
        115                 120                 125

Leu Val Lys Met Trp Glu Asp Glu Val Lys Asp Tyr Asn Pro Lys Lys
    130                 135                 140

Lys Phe Ser Gly Asn Asp Phe Leu Lys Thr Gly His Tyr Thr Gln Met
145                 150                 155                 160

Val Trp Ala Asn Thr Lys Glu Val Gly Cys Gly Ser Ile Lys Tyr Ile
                165                 170                 175

Gln Glu Lys Trp His Lys His Tyr Leu Val Cys Asn Tyr Gly Pro Ser
            180                 185                 190

Gly Asn Phe Met Asn Glu Glu Leu Tyr Gln Thr Lys
        195                 200
```

<210> 82

<211> 212

<212> PRT

<213> Solenopsis invicta

<400> 82

```
Thr Asn Tyr Cys Asn Leu Gln Ser Cys Lys Arg Asn Asn Ala Ile His
1               5                   10                  15

Thr Met Cys Gln Tyr Thr Ser Pro Thr Pro Gly Pro Met Cys Leu Glu
            20                  25                  30

Tyr Ser Asn Val Gly Phe Thr Asp Ala Glu Lys Asp Ala Ile Val Asn
        35                  40                  45

Lys His Asn Glu Leu Arg Gln Arg Val Ala Ser Gly Lys Glu Met Arg
    50                  55                  60

Gly Thr Asn Gly Pro Gln Pro Pro Ala Val Lys Met Pro Asn Leu Thr
65                  70                  75                  80
```

```
Trp Asp Pro Glu Leu Ala Thr Ile Ala Gln Arg Trp Ala Asn Gln Cys
                85                  90                  95

Thr Phe Glu His Asp Ala Cys Arg Asn Val Glu Arg Phe Ala Val Gly
            100                 105                 110

Gln Asn Ile Ala Ala Thr Ser Ser Ser Gly Lys Asn Lys Ser Thr Pro
        115                 120                 125

Asn Glu Met Ile Leu Leu Trp Tyr Asn Glu Val Lys Asp Phe Asp Asn
    130                 135                 140

Arg Trp Ile Ser Ser Phe Pro Ser Asp Asp Asn Ile Leu Met Lys Val
145                 150                 155                 160

Glu His Tyr Thr Gln Ile Val Trp Ala Lys Thr Ser Lys Ile Gly Cys
                165                 170                 175

Ala Arg Ile Met Phe Lys Glu Pro Asp Asn Trp Thr Lys His Tyr Leu
            180                 185                 190

Val Cys Asn Tyr Gly Pro Ala Gly Asn Val Leu Gly Ala Pro Ile Tyr
        195                 200                 205

Glu Ile Lys Lys
    210
```

<210> 83

<211> 136

<212> PRT

<213> Lycopersicon esculentum

<400> 83

```
Gln Asn Ser Pro Gln Asp Tyr Leu Ala Val His Asn Asp Ala Arg Ala
1               5                   10                  15

Gln Val Gly Val Gly Pro Met Ser Trp Asp Ala Asn Leu Ala Ser Arg
            20                  25                  30

Ala Gln Asn Tyr Ala Asn Ser Arg Ala Gly Asp Cys Asn Leu Ile His
        35                  40                  45

Ser Gly Ala Gly Glu Asn Leu Ala Lys Gly Gly Gly Asp Phe Thr Gly
```

50 55 60

Arg Ala Ala Val Gln Leu Trp Val Ser Glu Arg Pro Ser Tyr Asn Tyr
65 70 75 80

Ala Thr Asn Gln Cys Val Gly Gly Lys Lys Cys Arg His Tyr Thr Gln
85 90 95

Val Val Trp Arg Asn Ser Val Arg Leu Gly Cys Gly Arg Ala Arg Cys
100 105 110

Asn Asn Asn Gly Trp Trp Phe Ile Ser Cys Asn Tyr Asp Pro Val Gly
115 120 125

Asn Trp Ile Gly Gln Arg Pro Tyr
130 135

<210> 84

<211> 187

<212> PRT

<213> Schizophyllum commune

<400> 84

Ser Pro Ala Pro Val Asp Val Asp Ala Arg Ala Pro Val Ala Leu Asp
1 5 10 15

Ser Arg Ser Ile Asp Ile Asp Ser Arg Ser Ala Asp Ala Leu Ala Asn
20 25 30

Arg Ala Ala Pro Pro Gln Ser Glu Ile Asp Gln Trp Leu Lys Ala His
35 40 45

Asn Asn Glu Arg Ala Gln His Gly Ala Val Ala Leu Val Trp Asn Gln
50 55 60

Thr Leu Ser Asp Lys Ala Ala Asp Trp Ala Ser Gln Cys Ile Trp Glu
65 70 75 80

His Ser Asn Ser Gly Gln Asn Leu Ala Ala Trp Phe Ser Pro Gln Ala
85 90 95

Asn Lys Pro Met Asn Ile Ser Gln Gly Val Gly Gly Trp Asn Ala Glu
100 105 110

Glu Pro Asp Tyr Asn Thr Thr Thr Tyr Ser Gly Ala Gly His Trp Thr
115 120 125

Gln Val Val Trp Lys Ser Thr Thr Ser Val Gly Cys Ala Ala Tyr Ser
130 135 140

Cys Pro Pro Gly Thr Leu Gly Arg Lys Pro Thr Asp Pro Trp Lys Thr
145 150 155 160

Leu Trp Tyr Tyr Val Cys Asn Tyr Tyr Arg Pro Gly Asn Val Ser Pro
165 170 175

Arg Asp Lys Tyr Tyr Pro Ile Asn Val Gln Pro
180 185

<210> 85

<211> 239

<212> PRT

<213> Homo sapiens

<400> 85

Ser Thr Val Val Leu Leu Asn Ser Thr Asp Ser Ser Pro Pro Thr Asn
1 5 10 15

Asn Phe Thr Asp Ile Glu Ala Ala Leu Lys Ala Gln Leu Asp Ser Ala
20 25 30

Asp Ile Pro Lys Ala Arg Arg Lys Arg Tyr Ile Ser Gln Asn Asp Met
35 40 45

Ile Ala Ile Leu Asp Tyr His Asn Gln Val Arg Gly Lys Val Phe Pro
50 55 60

Pro Ala Ala Asn Met Glu Tyr Met Val Trp Asp Glu Asn Leu Ala Lys
65 70 75 80

Ser Ala Glu Ala Trp Ala Ala Thr Cys Ile Trp Asp His Gly Pro Ser
85 90 95

Tyr Leu Leu Arg Phe Leu Gly Gln Asn Leu Ser Val Arg Thr Gly Arg
100 105 110

Tyr Arg Ser Ile Leu Gln Leu Val Lys Pro Trp Tyr Asp Glu Val Lys
115 120 125

Asp Tyr Ala Phe Pro Tyr Pro Gln Asp Cys Asn Pro Arg Cys Pro Met
130 135 140

Arg Cys Phe Gly Pro Met Cys Thr His Tyr Thr Gln Met Val Trp Ala
145 150 155 160

Thr Ser Asn Arg Ile Gly Cys Ala Ile His Thr Cys Gln Asn Met Asn
165 170 175

Val Trp Gly Ser Val Trp Arg Arg Ala Val Tyr Leu Val Cys Asn Tyr
180 185 190

Ala Pro Lys Gly Asn Trp Ile Gly Glu Ala Pro Tyr Lys Val Gly Val
195 200 205

Pro Cys Ser Ser Cys Pro Pro Ser Tyr Gly Gly Ser Cys Thr Asp Asn
210 215 220

Leu Cys Phe Pro Gly Val Thr Ser Asn Tyr Leu Tyr Trp Phe Lys
225 230 235

<210> 86

<211> 245

<212> PRT

<213> Homo sapiens

<400> 86

Ala Asn Ile Leu Pro Asp Ile Glu Asn Glu Asp Phe Ile Lys Asp Cys
1 5 10 15

Val Arg Ile His Asn Lys Phe Arg Ser Glu Val Lys Pro Thr Ala Ser
20 25 30

Asp Met Leu Tyr Met Thr Trp Asp Pro Ala Leu Ala Gln Ile Ala Lys
35 40 45

Ala Trp Ala Ser Asn Cys Gln Phe Ser His Asn Thr Arg Leu Lys Pro
50 55 60

Pro His Lys Leu His Pro Asn Phe Thr Ser Leu Gly Glu Asn Ile Trp
65 70 75 80

Thr Gly Ser Val Pro Ile Phe Ser Val Ser Ser Ala Ile Thr Asn Trp
85 90 95

```
Tyr Asp Glu Ile Gln Asp Tyr Asp Phe Lys Thr Arg Ile Cys Lys Lys
            100                 105                 110

Val Cys Gly His Tyr Thr Gln Val Val Trp Ala Asp Ser Tyr Lys Val
        115                 120                 125

Gly Cys Ala Val Gln Phe Cys Pro Lys Val Ser Gly Phe Asp Ala Leu
    130                 135                 140

Ser Asn Gly Ala His Phe Ile Cys Asn Tyr Gly Pro Gly Gly Asn Tyr
145                 150                 155                 160

Pro Thr Trp Pro Tyr Lys Arg Gly Ala Thr Cys Ser Ala Cys Pro Asn
                165                 170                 175

Asn Asp Lys Cys Leu Asp Asn Leu Cys Val Asn Arg Gln Arg Asp Gln
            180                 185                 190

Val Lys Arg Tyr Tyr Ser Val Val Tyr Pro Gly Trp Pro Ile Tyr Pro
        195                 200                 205

Arg Asn Arg Tyr Thr Ser Leu Phe Leu Ile Val Asn Ser Val Ile Leu
    210                 215                 220

Ile Leu Ser Val Ile Ile Thr Ile Leu Val Gln Leu Lys Tyr Pro Asn
225                 230                 235                 240

Leu Val Leu Leu Asp
                245
```

<210> 87

<211> 223

<212> PRT

<213> Heloderma horridum

<400> 87

```
Glu Ala Ser Pro Lys Leu Pro Gly Leu Met Thr Ser Asn Pro Asp Gln
1               5                   10                  15

Gln Thr Glu Ile Thr Asp Lys His Asn Asn Leu Arg Arg Ile Val Glu
            20                  25                  30

Pro Thr Ala Ser Asn Met Leu Lys Met Thr Trp Ser Asn Lys Ile Ala
```

35 40 45

Gln Asn Ala Gln Arg Ser Ala Asn Gln Cys Thr Leu Glu His Thr Ser
50 55 60

Lys Glu Glu Arg Thr Ile Asp Gly Val Glu Cys Gly Glu Asn Leu Phe
65 70 75 80

Phe Ser Ser Ala Pro Tyr Thr Trp Ser Tyr Ala Ile Gln Asn Trp Phe
85 90 95

Asp Glu Arg Lys Tyr Phe Arg Phe Asn Tyr Gly Pro Thr Ala Gln Asn
100 105 110

Val Met Ile Gly His Tyr Thr Gln Val Val Trp Tyr Arg Ser Tyr Glu
115 120 125

Leu Gly Cys Ala Ile Ala Tyr Cys Pro Asp Gln Pro Thr Tyr Lys Tyr
130 135 140

Tyr Gln Val Cys Gln Tyr Cys Pro Gly Gly Asn Ile Arg Ser Arg Lys
145 150 155 160

Tyr Thr Pro Tyr Ser Ile Gly Pro Pro Cys Gly Asp Cys Pro Asp Ala
165 170 175

Cys Asp Asn Gly Leu Cys Thr Asn Pro Cys Lys Gln Asn Asp Val Tyr
180 185 190

Asn Asn Cys Pro Asp Leu Lys Lys Gln Val Gly Cys Gly His Pro Ile
195 200 205

Met Lys Asp Cys Met Ala Thr Cys Lys Cys Leu Thr Glu Ile Lys
210 215 220

<210> 88

<211> 222

<212> PRT

<213> Homo sapiens

<400> 88

Lys Asp Pro Ala Phe Thr Ala Leu Leu Thr Thr Gln Leu Gln Val Gln
1 5 10 15

Arg Glu Ile Val Asn Lys His Asn Glu Leu Arg Lys Ala Val Ser Pro
20 25 30

Pro Ala Ser Asn Met Leu Lys Met Glu Trp Ser Arg Glu Val Thr Thr
35 40 45

Asn Ala Gln Arg Trp Ala Asn Lys Cys Thr Leu Gln His Ser Asp Pro
50 55 60

Glu Asp Arg Lys Thr Ser Thr Arg Cys Gly Glu Asn Leu Tyr Met Ser
65 70 75 80

Ser Asp Pro Thr Ser Trp Ser Ser Ala Ile Gln Ser Trp Tyr Asp Glu
85 90 95

Ile Leu Asp Phe Val Tyr Gly Val Gly Pro Lys Ser Pro Asn Ala Val
100 105 110

Val Gly His Tyr Thr Gln Leu Val Trp Tyr Ser Thr Tyr Gln Val Gly
115 120 125

Cys Gly Ile Ala Tyr Cys Pro Asn Gln Asp Ser Leu Lys Tyr Tyr Tyr
130 135 140

Val Cys Gln Tyr Cys Pro Ala Gly Asn Asn Met Asn Arg Lys Asn Thr
145 150 155 160

Pro Tyr Gln Gln Gly Thr Pro Cys Ala Gly Cys Pro Asp Asp Cys Asp
165 170 175

Lys Gly Leu Cys Thr Asn Ser Cys Gln Tyr Gln Asp Leu Leu Ser Asn
180 185 190

Cys Asp Ser Leu Lys Asn Thr Ala Gly Cys Glu His Glu Leu Leu Lys
195 200 205

Glu Lys Cys Lys Ala Thr Cys Leu Cys Glu Asn Lys Ile Tyr
210 215 220

<210> 89

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> peptide

<400> 89

Glu Ala Glu Ala Glu Phe
1 5

<210> 90

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> peptide

<400> 90

Glu Ala Glu Phe
1

<210> 91

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> peptide

<400> 91

Arg Glu Ala Glu Ala Glu Phe
1 5

<210> 92

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> peptide

<400> 92

Glu Glu Gly Val Ser Leu Glu Lys Arg
1 5

<210> 93

<211> 50

<212> PRT

<213> Vespula vulgaris

<400> 93

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Ser Leu Lys Pro Asn Cys Gly Asn Lys Val Val Val
20 25 30

Ser Tyr Gly Leu Thr Lys Gln Glu Lys Gln Asp Ile Leu Lys Glu His
35 40 45

Asn Asp
50

<210> 94

<211> 57

<212> PRT

<213> Vespula vulgaris

<400> 94

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Ser Leu Lys Pro Asn Cys Gly Asn Lys Val Val Val
20 25 30

Ser Tyr Gly Leu Thr Lys Gln Glu Lys Gln Asp Ile Leu Lys Glu His
35 40 45

Asn Asp Phe Arg Gln Lys Ile Ala Arg
50 55

<210> 95

<211> 76

<212> PRT

<213> Vespula vulgaris

<400> 95

Asn Asn Tyr Cys Lys Ile Lys Cys Leu Lys Gly Gly Val His Thr Ala
1 5 10 15

Cys Lys Tyr Gly Ser Leu Lys Pro Asn Cys Gly Asn Lys Val Val Val
20 25 30

Ser Tyr Gly Leu Thr Lys Gln Glu Lys Gln Asp Ile Leu Lys Glu His
35 40 45

Asn Asp Phe Arg Gln Lys Ile Ala Arg Gly Leu Glu Thr Arg Gly Asn
50 55 60

Pro Gly Pro Gln Pro Pro Ala Lys Asn Met Lys Asn
65 70 75

<210> 96

<211> 150

<212> DNA

<213> Vespula vulgaris

<400> 96
aacaattatt gtaaaataaa atgtttgaaa ggaggtgtcc atactgcctg caaatatgga 60

agtcttaaac cgaattgcgg taataaggta gtggtatcct atggtctaac gaaacaagag 120

aaacaagaca tcttaaagga gcacaatgac 150

<210> 97

<211> 171

<212> DNA

<213> Vespula vulgaris

<400> 97
aacaattatt gtaaaataaa atgtttgaaa ggaggtgtcc atactgcctg caaatatgga 60

agtcttaaac cgaattgcgg taataaggta gtggtatcct atggtctaac gaaacaagag 120

aaacaagaca tcttaaagga gcacaatgac tttagacaaa aaattgcacg a 171

<210> 98

<211> 228

<212> DNA

<213> Vespula vulgaris

<400> 98
aacaattatt gtaaaataaa atgtttgaaa ggaggtgtcc atactgcctg caaatatgga 60

agtcttaaac cgaattgcgg taataaggta gtggtatcct atggtctaac gaaacaagag 120

aaacaagaca tcttaaagga gcacaatgac tttagacaaa aaattgcacg aggattggag 180

actagaggta atcctggacc acagcctcca gcgaagaata tgaaaaat 228

<210> 99

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> Synthetic peptide

<400> 99

Lys Arg Glu Ala Glu Ala Glu Phe
1 5